Remarks

The Applicants acknowledge the rejection of Claims 1 and 3 under 35 U.S.C. §103 over EP '118. The Applicants respectfully submit that both claims are patentable over EP '118 for the reasons set forth in detail below.

The Applicants note with appreciation the Examiner's helpful comments concerning the quantity of Ca found in the rust-resistant steel as well as the low S content. The Applicants further note with appreciation the Examiner's frank acknowledgment that EP '118 does not specifically teach that at least 80% of inclusions of 2 microns or larger will have an equilibrium sulfur soluble amount of 0.03 wt% or less.

The Applicants respectfully submit that such a claimed aspect of the invention would not be obvious over EP '118. EP '118 discloses a process for continuous casting ultralow-carbon aluminum-killed steel. Rusting of the steel is prevented by casting the steel at a concentration of Ca of 6 – 20 ppm and wherein the amount of S is 0.01 wt% or less, O is 30 ppm or less and the degree of superheating of the molten steel in a tundish is 16°C or above. Also, the average flow rate of the molten steel in the nozzle should be 1.2 m/sec or above.

The Examiner helpfully points out that the Applicants' claimed aspect of at least 80% of inclusions of 2 microns or larger would have an equilibrium sulfur soluble amount of 0.3 wt% or less would be expected since EP '118 utilizes similar processes and obtains similar properties. The Examiner helpfully points out that the EP '118 steel is produced by deoxidizing with Al and Ti, followed by Ca, to form $CaO\text{-}Al_2O_3$ inclusions with CaS. It is also noted that CaS hydrolyzes and forms rust.

The problem with EP '118 is that it provides insufficient teachings to those of ordinary skill in the art that would lead such a person to the claimed subject matter. In that regard, the Applicants

respectfully submit that EP '118 is actually non-enabling with respect to the "similar process." Specifically, EP '118 is virtually devoid of both fundamentals and details as to the production of the EP '118 steel sheets. The disclosure provides the quantities of various compositions of molten steel, mentions that calcium is added to the aluminum-killed steel and teaches that the continuous cast or ingot-made steels are hot-rolled and cold-rolled. However, there is nothing more. Those of ordinary skill in the art are well aware that process steps are important in producing steel sheets. The presence or absence of various steps in the process of making steel sheets, as well as the order of such steps, can have profound differences in the characteristics and properties of such steel sheets. Further details with respect to processes are discussed below. In any event, the compositions of the EP '118 steel are different from those of this invention. These differences in composition can also greatly effect the physical characteristics and properties of steel sheets. For example, in Example 1 of the Applicants' Specification, the Ti concentration was 0.04 wt%. This is outside of the range disclosed by EP '118 which was at a maximum of 0.03 wt%. This causes differences in the relative percentages of CaO, Al_2O_3 and TiO_2 in the resulting steel. This effects the resulting properties.

As another example, the Applicants' Example 1 recites that the steel slab is cold-rolled after hot-rolling to a particular thickness, followed by annealing at a temperature of 780°C for 45 seconds. Those of ordinary skill in the art are well aware that such additional process steps, nowhere remotely disclosed by EP '118, have serious effects on the resulting properties of the steel, depending on the temperature and/or the time before the duration of the annealing. For example, this can have a dramatic impact on the size of inclusions of the type that are recited in the Applicants' solicited claims and the size of other grains not specifically claimed. Such things can and do have a serious impact on the physical properties of steel sheets. There is utterly no disclosure as to steps of this type that could theoretically have been performed in EP '118. The problem is that there is no

disclosure of this type in EP '118 that would give one of ordinary skill in the art any confidence that the steels of the invention would have the same properties as those of EP '118 or could reasonably be expected to have such properties. It would be speculation, not supported by the prior art disclosure, to say that the respective steels would or could be similar.

In fact, the disclosures of EP '118 and the Applicants' disclosures suggest just the opposite. EP '118 disclosed its surprise that the S content in the steel versus the index of rust occurrence in a rusting test would change so drastically when adding 0.01 wt% S. In sharp contrast, because of the differences in process conditions and/or components of the respective steels, the Applicants surprisingly found that the 0.01 wt% point was not correct in the context of this invention. Instead, the Applicants surprisingly found that the weight percent of 0.03 wt% causes a dramatic change. This is shown in Fig. 2 of the Applicants' Drawings. The phenomenon of EP '118 is set forth in Fig. 6 thereof. In each case, there is a very distinct and sharp curve that sets out a surprising phenomenon. However, those phenomenon are different. Thus, the respective disclosures of EP '118 and the Applicants' factually demonstrate that the physical properties are, in fact, quite different.

As a consequence, the Applicants respectfully submit that one of ordinary skill in the art would have no reasonable expectation, based on the limited process information supplied by EP '118, that the steels of the invention would reasonably be expected to be achieved based on that EP '118 disclosure. In fact, the Applicants respectfully submit that the Applicants would reasonably expect the physical properties to be quite different. Accordingly, the Applicants respectfully submit that the steels of the invention are anything but obvious over EP '118. Withdrawal of the 35 U.S.C. §103 rejection is accordingly respectfully requested.

The Applicants have also added new Claims 5 – 8 and respectfully request that they be

considered on the merits. Support may be found on page 9, beginning at line 19, through page 10, line 5, wherein the Ca content is varied from 0.005 to 0.0040 wt% and the S content is varied from 0.002 to 0.020 wt%. Also, Example 1 discloses a Ca content of 15 ppm and an S content of 0.010 wt%. Consequently, the Ca content of 0.0015 to 0.0040 wt% and the S content of 0.010 to 0.020 wt% are disclosed.

The Applicants respectfully submit that Claims 5 – 8 are patentable over EP '118. EP '118 narrowly limits the Ca content and the S content as shown in Figs. 2 and 6 to 8, by attempting to find the area wherein rust-resistance and non-clogging properties are compatible. In sharp contrast, by controlling the amount of S soluble to CaO-containing oxide in the equilibrium state, the S and Ca contents are free from such a limitation in this invention. Claims 5 to 8 emphasize this difference.

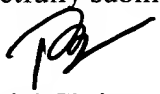
Regarding the Ca content in Claims 5 and 7, EP '118 discloses that up to 20 ppm of Ca is preferred. However, that result (shown in Fig. 7) came from the experiment in which Ca was varied from 6 to 30 ppm, S was varied from 0.005 to 0.009 wt% (page 6, lines 44 to 47), and O was varied within the range of from 18 to 23 ppm (Table 2). In the Applicants' Response to the Office Action of November 20, 2002, filed on February 20, 2003, the Applicants disclosed a process for calculating the minimum O content required to satisfy the condition of the equilibrium S soluble amount (page 7). Applying the same calculation, when the Ca content is 20 ppm (and regarding S content to be 0.005 wt% to minimize the required O content), the minimum O content required is around 27 ppm. That means, with at least a Ca content of 20 ppm or somewhat smaller, it is highly likely that the equilibrium S soluble amount is not satisfied. This fact establishes that the assumption that the equilibrium S soluble amount would be inherently satisfied because of the property achieved in EP '118 is incorrect and, thus, inapplicable.

Concerning Fig. 7, when the Ca content is 15 ppm, the minimum O content is calculated as 20 ppm for an S content of 0.005 wt% and 32 ppm for an S content of 0.009 wt%. In the Example in Table 4 (the O content is within the range of from 19 to 25 ppm according to Table 3), when the Ca content is 15 ppm, the minimum O content is calculated as 19 ppm for an S content of 0.004 wt% and 28 ppm for an S content of 0.008 wt%. The result shows that there is only a very remote possibility that the equilibrium S soluble amount would satisfy the condition at Ca content of 15 ppm. Such a remote possibility simply does not rise to a reasonable likelihood as required by §103.

Regarding the S content of Claims 6 and 8, EP '118 simply suggests limiting the content of S to less than 0.01 wt% (Claim 1). Thus, EP '118 is not applicable.

Allowance of the entire Application is respectfully requested.

Respectfully submitted,



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